

Connecting Streamline Series VNA with Thunderbolt 3 PC

Keysight Technologies

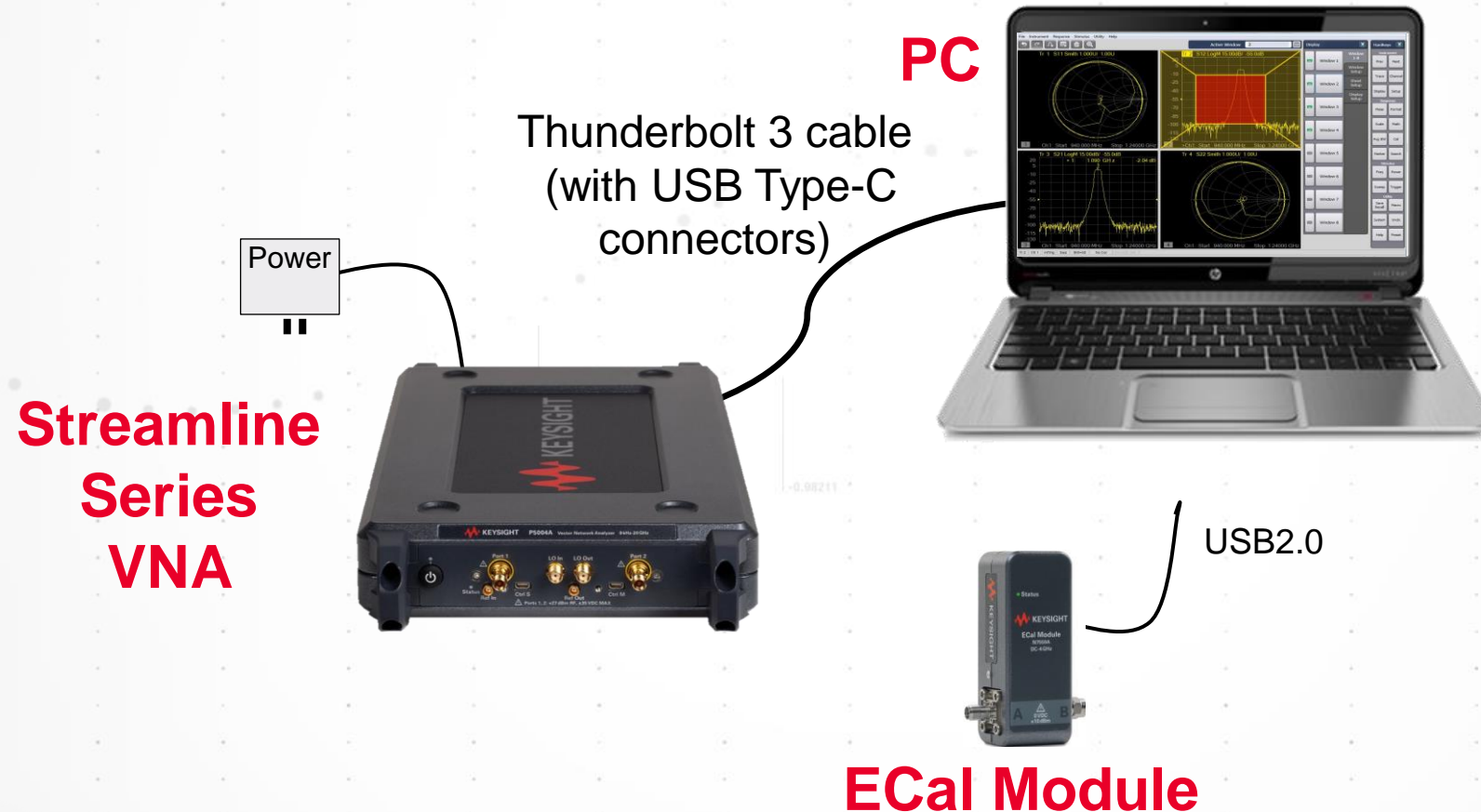
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- Host PC requirement
- Recommended PC list
- Troubleshooting for connecting VNA and host PC

Streamline Series VNA (B-model) Basic Setup

- Take advantage of powerful PC hardware (faster processor, better displays)
- No data storage memory on VNA. Well-suited for classified environment



Consideration of Host PC for P93xxB



- Requires 64-bit Windows 10 OS and Thunderbolt 3 with USB Type-C interface
- It is recommended to **install the latest version** of BIOS, Thunderbolt 3 controller firmware and driver, or Windows OS before launching VNA firmware with P50xxB or P93xxB.
- See PC list verified by Keysight (next page)
- USB2.0 or 3.0 connection is not supported.
- Connection via USB3.0-to-Thunderbolt 3 adapter is not supported.
- Thunderbolt 4 connection is supported.
- Windows 11 (64-bit) is supported.

Host PC requirements

PC System Requirement	
Operating Systems	Windows 10 (64-bit only) Version 1909 or later
Available Memory	16 GB recommended, 4 GB minimum
Available Disk space	2 GB available disk space minimum
Display resolution	1024 x 768 minimum
Connection with VNA	Thunderbolt 3
Recommended CPU	Intel Core i7 10 th Generation or later

Thunderbolt 3 Host PC and VNA compatibility list

PC Maker	PC model name	CPU Gen - Code name	CPU	OS Microsoft Windows	BIOS	Thunderbolt Controller (chipset) Gen	# of Thunderbolt3 connectors	Single VNA operation (1module model) ^{A,1}	Single VNA operation (2modules model) ^{B,1}	Two VNA operation (star topology)	Two VNA operation (daisy topology)	Verified by
Laptop/Mobile workstation												
Dell	Precision 5530	8 th Gen - Coffee Lake	Intel Core i7-8850H	Windows 11 Professional (x64)	1.24.0, 3/21/2022	15D9	1	Pass	Pass	N/A	Pass	Keysight
Dell	Precision 5550	10 th Gen - Comet Lake	Intel Core i7-10750H	Windows 10 Professional (x64)	1.6.1, 1/14/2021	15EB	2	Pass	Pass	Pass	Pass	Keysight
Dell	Precision 7550	10 th Gen - Comet Lake	Intel Core i7-10850H	Windows 10 Professional (x64)	1.5.1, 11/25/2020	15EB	2	Pass	Pass	Pass	Pass	Keysight
HP	EliteBook 830 G6	8 th Gen – Whiskey Lake	Intel Core i5-8365U	Windows 10 Professional (x64)	R70 Ver 01.12.20	15EB	1	Pass	not tested	N/A	not tested	Keysight
HP	EliteBook 830 G7	10 th Gen - Comet Lake	Intel Core i5-10210U	Windows 10 Professional (x64)		15EB	2	Fail	not tested	not tested	not tested	end user
HP	EliteBook 840 G6	8 th Gen – Whiskey Lake	Intel Core i5-8365U	Windows 10 Professional (x64)	R70 Ver.01.20.00, 5/10/2022	15E8	1	Pass	Pass	N/A	Fail	Keysight
HP	EliteBook 840 G7	10 th Gen - Comet Lake	Intel Core i5-10310U	Windows 10 Professional (x64)	S70 Ver.01.09.00, 5/10/2022	15EB	1	Pass	Pass	N/A	Pass	Keysight
HP	ZBook 15 G4	7 th Gen - Kaby Lake	Intel Core i7-7020HQ	Windows 10 Professional (x64)	P70 Ver.01.41, 4/29/2022	15EB ⁶	2	Pass	not tested	not tested	not tested	Keysight
HP	ZBook 15 G5	8 th Gen - Coffee Lake	Intel Core i7-8850H	Windows 10 Professional (x64)	Q70 Ver 01.19.00, 1/27/2022	15EB	2	Pass	Pass	Pass	not tested	Keysight
HP	ZBook 15 G6	9 th Gen - Coffee Lake	Intel Core i9-9880H	Windows 10 Professional (x64)	R92 Ver 01.20.00, 3/23/2022	15EB	2	Pass	Pass	Pass	Pass	Keysight
HP	ZBook Studio G7	10 th Gen - Comet Lake	Intel Core i7-10750H	Windows 10 Professional (x64)	S91 Ver.01.90.00, 5/10/2022	15EB	2	Pass	Pass	Pass	Pass	Keysight
HP	ZBook Firefly 14 G7	10 th Gen - Comet Lake	Intel Core i7-10810U	Windows 10 Professional (x64)	S70 Ver.01.09.00, 4/7/2022	15EB	2	Pass	Pass	Pass	Pass	Keysight
Lenovo	ThinkPad P52	8 th Gen - Coffee Lake	Intel Core i7-8750H	Windows 10 Professional (x64)	N2CET63W (1.46), 3/23/2022	15EB	2	Pass	Pass	Pass	Pass	Keysight
Lenovo	ThinkPad P53	9 th Gen - Coffee Lake	Intel Core i7-9850H	Windows 10 Professional (x64)	N2NUJ21W (1.36), 3/30/2022	15EB	2	Pass	Pass	Pass	Pass	Keysight
Lenovo	ThinkPad X1 Carbon Gen 8	10 th Gen - Comet Lake	Intel Core i7-10510U	Windows 10 Home (x64)	N2WUJ22W (1.26), 4/27/2022	15D2	2	Pass	not tested	not tested	not tested	end user
LG	gram 14Z90N-VR51J	10 th Gen - Ice Lake	Intel Core i5-1035G7	Windows 10 Home (x64)		8A17	1	Pass	Fail	N/A	not tested	end user
LG	gram 15ZB95N	11 th Gen - Tiger Lake	Intel Core i5-1135G7	Windows 10 Enterprise (x64)		9A1B	1	not tested	Fail	N/A	not tested	end user
Panasonic	CF-LV8RD7VS	8 th Gen – Whiskey Lake	Intel Core i5-8365U	Windows 10 Professional (x64)		15D9	1	Pass	not tested	N/A	not tested	end user
Toshiba	Dynabook UZ63/L	8 th Gen – Whiskey Lake	Intel Core i7-8565U	Windows 10 Home (x64)			2	Pass	Pass	not tested	not tested	end user

Note:

^A 1 module model: P93xxB, P500xB, P5020B-400/600, P5021B-400/600, P5022B-400/600, P5023B-400/600, P5024B-400/600

^B 2 modules model: P5020B-402, P5021B-402, P5022B-402, P5023B-402, P5024B-402, P5025B, P5026B, P5027B, P5028B

¹ English OS can work correctly, but Simplified Chinese OS/Traditional Chinese OS cannot work correctly. (Hot plug-in/out of VNA is not working correctly)

Thunderbolt 3 Host PC and VNA compatibility list

PC Maker	PC model name	CPU Gen - Code name	CPU	OS Microsoft Windows	BIOS	Thunderbolt Controller (chipset) Gen	# of Thunderbolt3 connectors	Single VNA operation (1module model) ^{A.1}	Single VNA operation (2modules model) ^{B.1}	Two VNA operation (star topology)	Two VNA operation (daisy topology)	Verified by
Desktop												
Dell	Precision 5820 Tower	6 th Gen - Skylake	Intel Xeon W-2135	Windows 10 Professional (x64) for V2.19.1, 4/5/2022		15D2 ²	2	Fail	Fail	Fail	Fail	Keysight
HP	Z1 G8 Tower	11 th Gen - Rocket Lake	Intel Core i9-11900	Windows 11 Professional (x64)	T01 Ver. 02.08.00, 4/14/2022	1134	1	Pass	Pass	N/A	not tested	Keysight
HP	Z2 G8 Tower	11 th Gen - Rocket Lake	Intel Xeon W-1370	Windows 10 Professional (x64) for V	T50 Ver. 01.04.02, 3/17/2022	1134	2	Pass	Pass	not tested	not tested	Keysight
HP	Z4 G4	6 th Gen - Skylake	Intel Xeon W-2123	Windows 10 Enterprise (x64)	P61 Ver.02.74 7/6/2021	15D2 ³	2	Pass ^{4,5}	Pass ^{4,5}	Fail	Fail	Keysight
HP	Z6 G4	6 th Gen - Skylake	Intel Xeon Silver 4114	Windows 10 Professional (x64) for V	P60 Ver.02.78, 1/20/2022	15D2 ³	2	Pass ^{4,5}	Pass ^{4,5}	Fail	Fail	Keysight
Mini-PC												
Asus	PN62	10 th Gen - Comet Lake	Intel Core i7-10710U	Windows 11 Home Single Language	1005, 11/16/2021	15BF	1	Fail	Fail	N/A	Fail	Keysight
Dell	Optiplex 7070	9 th Gen - Coffee Lake	Intel Core i7-9700	Windows 10 Professional (x64)	1.13.0, 3/22/2022	15D2	2	Pass	Pass	not tested	not tested	Keysight
HP	Z2 G8 SFF	11 th Gen - Rocket Lake	Intel Core i5-11500	Windows 11 Professional (x64)	T50 Ver. 01.04.02, 3/17/2022	1134	1	Pass	Pass	N/A	not tested	Keysight

Note:

^A 1 module model: P93xxB, P500xB, P5020B-400/600, P5021B-400/600, P5022B-400/600, P5023B-400/600, P5024B-400/600

^B 2 modules model: P5020B-402, P5021B-402, P5022B-402, P5023B-402, P5024B-402, P5025B, P5026B, P5027B, P5028B

¹ English OS can work correctly, but Simplified Chinese OS/Traditional Chinese OS cannot work correctly. (Hot plug-in/out of VNA is not working correctly)

² Requires PCIe card, R9MN8. Other PC maker's PCIe card is not compatible.

³ Requires PCIe card, 3UU05AA. Other PC maker's PCIe card is not compatible.

⁴ 15D2 is unstable to communicate with P50xxB/P93xxB.

⁵ Known issues: (1) Only Port-A of Controller PC can communicate with P50xxB/P93xxB, due to PCIe resource limitations.

(2) 2m/40Gbps Thunderbolt 3 active cable cannot communicate with P50xxB/P93xxB both on Port-A and on Port-B.

⁶ Thunderbolt Controller chipset driver was copied from Zbook 15 G5.

Thunderbolt 4 Host PC and VNA compatibility list

PC Maker	PC model name	CPU Gen - Code name	CPU	OS Microsoft Windows	BIOS	Thunderbolt Controller (chipset) Gen	# of Thunderbolt4 connectors	Single VNA operation (1module model) ^{A,1}	Single VNA operation (2modules model) ^{B,1}	Two VNA operation (star topology)	Two VNA operation (daisy topology)	Verified by
Laptop/Mobile workstation												
Acer	Swift SF314-511	11 th Gen - Tiger Lake	Intel Core i5-1135G7	Windows 10 Home (x64)		9A1B	1	Pass	not tested	N/A	not tested	end user
Asus	ZenBook UX425EA	11 th Gen - Tiger Lake	Intel Core i5-1135G7	Windows 10 Home (x64)	Version 309, 12/25/2021	9A1B/9A1D	2	Fail	not tested	not tested	not tested	end user
Dell	Latitude 5320	11 th Gen - Tiger Lake	Intel Core i7-1185G7	Windows 11 Professional (x64)	1.5.1, 4/12/2022	9A1B	2	Pass	Pass	not tested	not tested	Keysight
Dell	Latitude 5520	11 th Gen - Tiger Lake	Intel Core i7-1165G7	Windows 10 Professional (x64)	1.18.1, 5/9/2022	9A1B	2	Pass	Pass	not tested	not tested	Keysight
Dell	Latitude 7520	11 th Gen - Tiger Lake	Intel Core i7-1185G7	Windows 11 Professional (x64)	1.4.4, 3/9/2021	9A1B	2	Pass	not tested	not tested	not tested	end user
Dell	Precision 3560	11 th Gen - Tiger Lake	Intel Core i7-1185G7	Windows 10 Professional (x64)	1.18.1, 4/14/2022	9A1B	2	Pass	Pass	not tested	not tested	Keysight
Dell	Precision 3561	11 th Gen - Tiger Lake	Intel Core i7-11850H	Windows 10 Enterprise (x64)	1.11.1, 4/14/2022	9A1F	2	Pass	Pass	not tested	not tested	Keysight
HP	EliteBook 840 Aero G8	11 th Gen - Tiger Lake	Intel Core i7-1165G7	Windows 10 Professional (x64)	T76 Ver.01.09.01, 5/24/2022	9A1B	2	Pass	not tested	not tested	not tested	end user
HP	EliteBook 850 G8	11 th Gen - Tiger Lake	Intel Core i7-1165G7	Windows 10 Professional (x64)	T76 Ver.01.08.20, 3/11/2022	9A1B	2	Pass	Pass	not tested	not tested	Keysight
HP	ProBook 650 G8	11 th Gen - Tiger Lake	Intel Core i5-1135G7	Windows 10 Professional (x64)	T72 Ver.01.09.01, 5/13/2022	9A1B	1	Pass	not tested	N/A	not tested	end user
HP	Spectre x360 Conpartible 15-eb 1x	11 th Gen - Tiger Lake	Intel Core i7-1165G7	Windows 11 Professional (x64)	AMI F08, 7/26/2021	9A1B	2		Fail	not tested	not tested	end user
HP	ZBook Power 15.6 G8	11 th Gen - Tiger Lake	Intel Core i7-11850H	Windows 11 Professional (x64)	T81 Ver.01.09.02, 5/5/2022	9A1F	2	Pass	Pass	not tested	not tested	Keysight
HP	ZBook Power 15.6 G8	11 th Gen - Tiger Lake	Intel Core i7-11850H	Windows 10 Enterprise (x64)	T81 Ver.01.09.02, 5/5/2022	9A1F	1	Pass	Fail	N/A	not tested	Keysight
Lenovo	ThinkBook 14 Gen2 ITL	11 th Gen - Tiger Lake	Intel Core i5-1135G7	Windows 10 Home (x64)	F8CN47WW (V2.10), 4/8/2022	9A1B	1	Pass	Fail	N/A	not tested	end user
Lenovo	ThinkBook 15 Gen2 ITL	11 th Gen - Tiger Lake	Intel Core i5-1135G7	Windows 11 Professional (x64)	F8CN47WW (V2.10), 4/8/2022	9A1B	1	Pass	Fail	N/A	not tested	end user
Lenovo	ThinkPad P15s Gen2	11 th Gen - Tiger Lake	Intel Core i7-1165G7	Windows 10 Professional (x64)	N34ET41W(1.41), 7/8/2021	9A1B/9A1D	2	Pass	not tested	not tested	not tested	Keysight
Lenovo	ThinkBook14s Yoga ITL	11 th Gen - Tiger Lake	Intel Core i7-1165G7	Windows 11 Professional (x64)	FNCN38WW, 4/25/2022	9A1B	1	Pass	not tested	N/A	not tested	end user
Desktop												
Dell	Precision 3650 Tower	11 th Gen - Rocket Lake	Intel Core i7-11700	Windows 11 Professional (x64)	1.11.0, 4/18/2022	1137	2	Pass	Pass	not tested	not tested	Keysight
Mini-PC												
Dell	Optiplex 7090 Ultra UFF	11 th Gen - Tiger Lake	Intel Core i5-1145G7	Windows 10 Professional (x64)	1.10.0, 4/19/2022	9A1D	1	Pass	Pass	N/A	not tested	Keysight
Intel	NUC11TNHi5	11 th Gen - Tiger Lake	Intel Core i5-1135G7	Windows 11 Enterprise (x64)	0064, 2/17/2022	9A1B/9A1D	2	Pass	Fail	Pass	Fail	Keysight

Note:

^A 1 module model: P93xxB, P500xB, P5020B-400/600, P5021B-400/600, P5022B-400/600, P5023B-400/600, P5024B-400/600

^B 2 modules model: P5020B-402, P5021B-402, P5022B-402, P5023B-402, P5024B-402, P5025B, P5026B, P5027B, P5028B

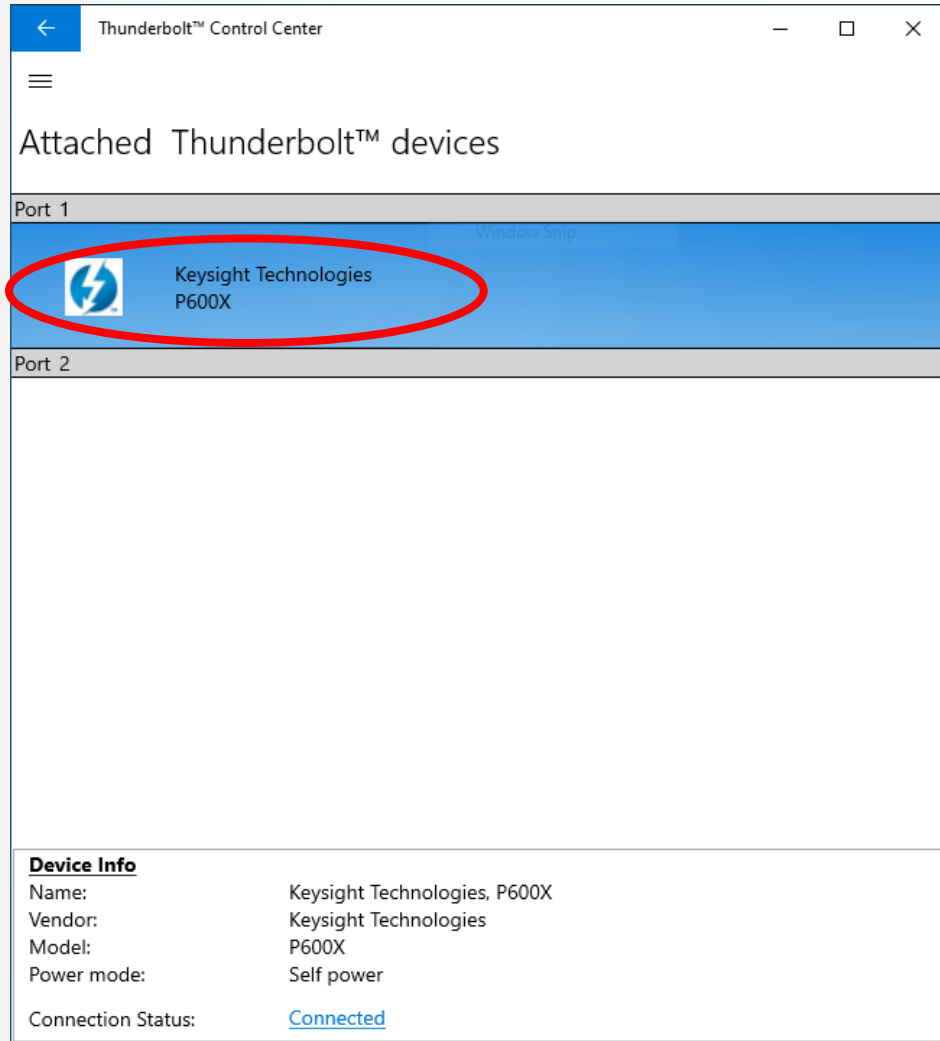
¹ English OS can work correctly, but Simplified Chinese OS/Traditional Chinese OS cannot work correctly. (Hot plug-in/out of VNA is not working correctly)

Troubleshooting – Connection of Host PC and VNA

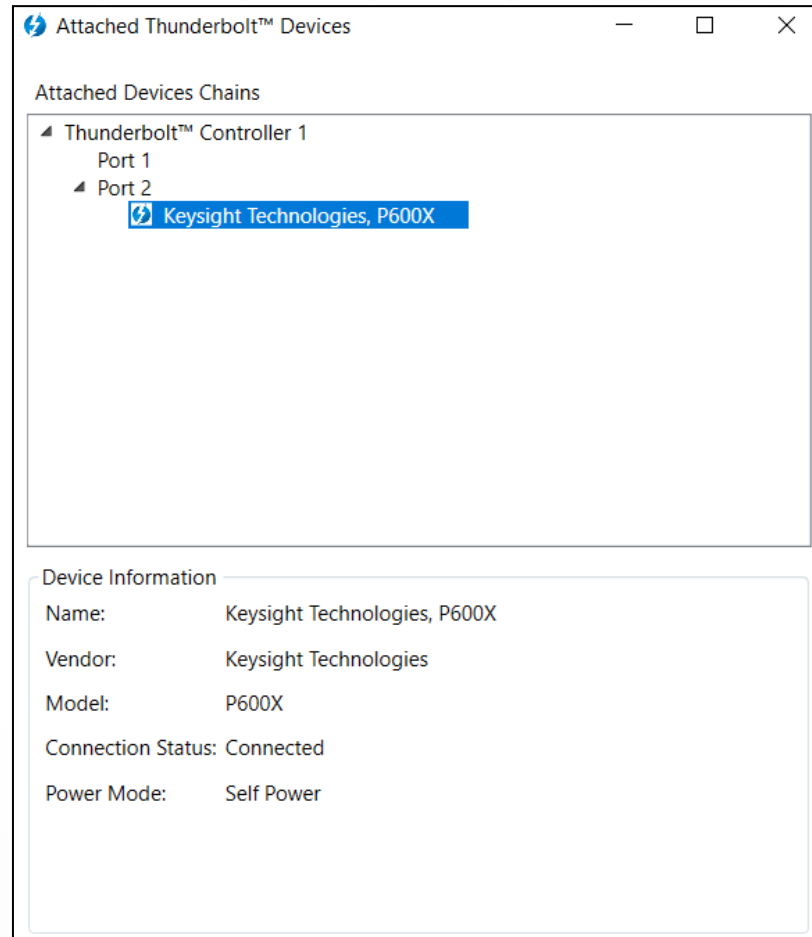
- If Streamline Series VNA (P93xxB or P50xxB) is not connected with PC correctly, confirm the followings:
 1. Is your VNA identified with Thunderbolt Control Center?
 2. What is revision of Thunderbolt Control Center?
 3. Is your VNA identified with Device manager?
 4. Is your VNA identified with Keysight Connection Expert?
 5. What is the model number of your host PC?
 6. Do you use the latest version of VNA firmware and Keysight IO Libraries?
 7. Are the latest BIOS revision, Thunderbolt firmware and Thunderbolt driver installed with PC?
 8. Is Kernel DMA Protection disabled?
 9. Is Windows 10 Fast Startup disabled?
 10. Is Thunderbolt 3 PCIe Hot plug mode in BIOS (UEFI) correctly set?
 11. Is Interconnect cables for LO or control signals at VNA front panel connected properly?



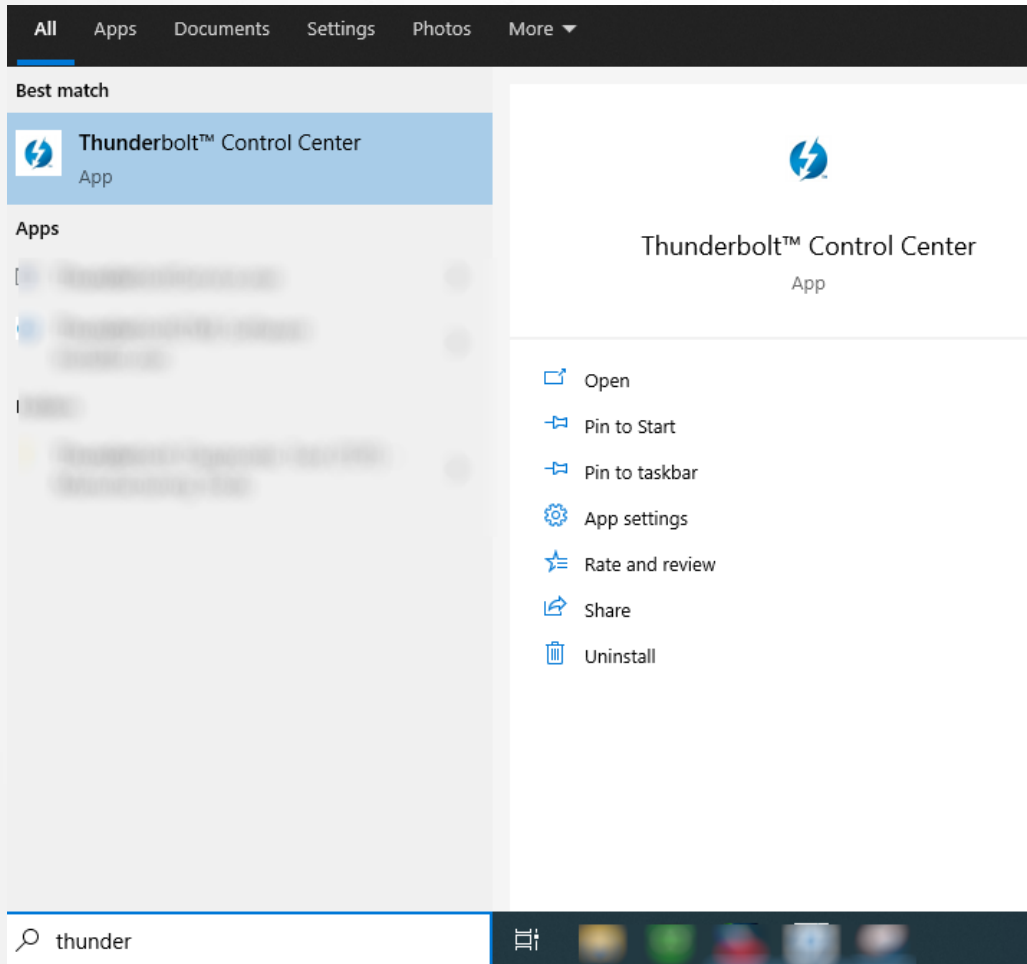
1. Is your VNA identified with Thunderbolt Control Center?



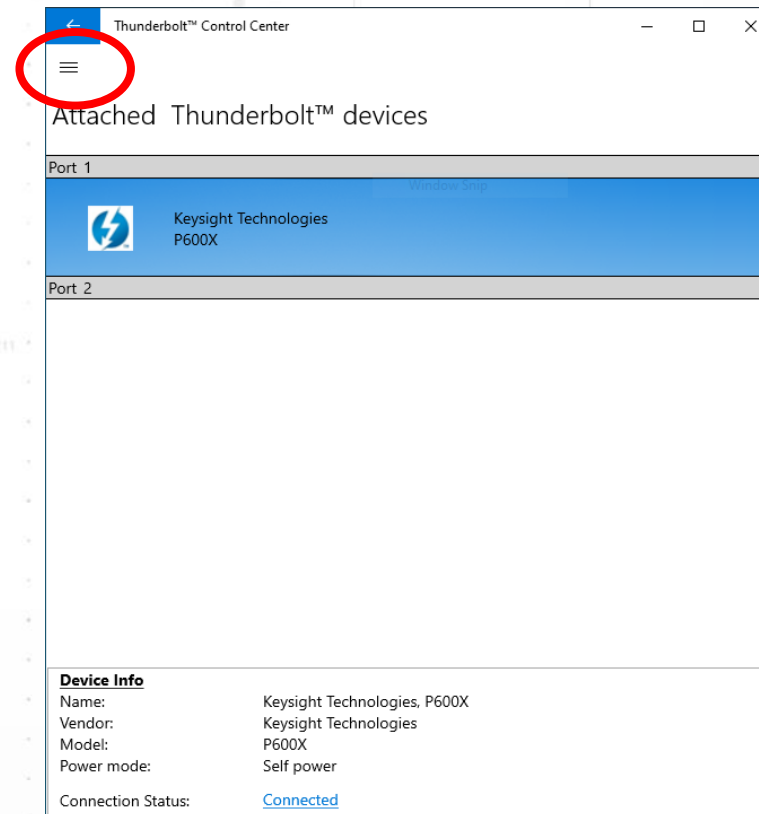
- If VNA is connected correctly, “P600x” (chassis of Streamline Series VNA) will be shown.



2. What is the revision of Thunderbolt Control Center?



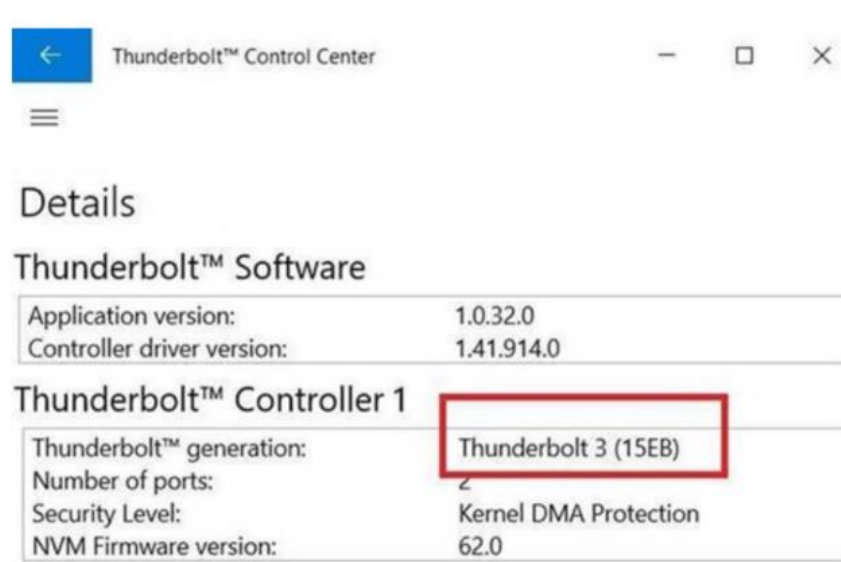
- Type in “Thunderbolt..” in the Windows search bar
- Select “Thunderbolt Control Center” to launch
- Click three-bar icon and identify the revision of Thunderbolt Control Center



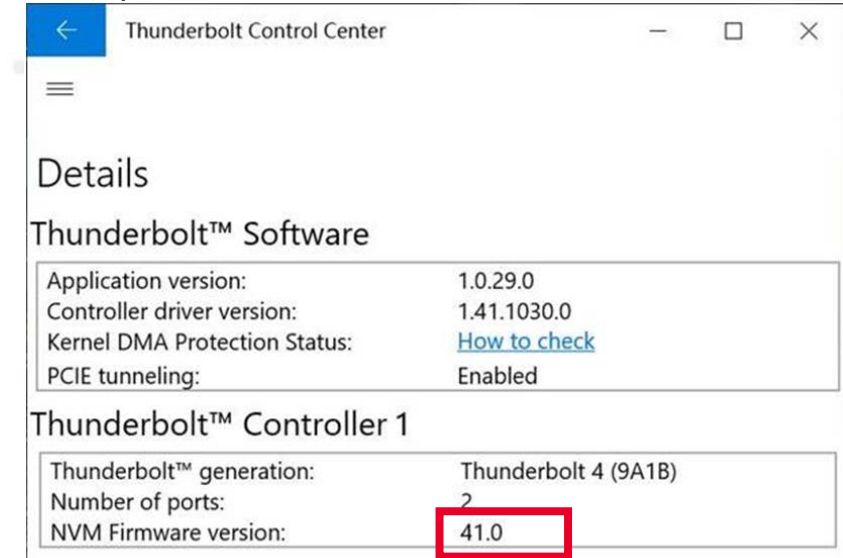
2. What is revision of Thunderbolt Control Center?

- Click “About”
- Check Thunderbolt generation and NVM Firmware (Thunderbolt firmware) version shown in dialog.

Ex1.)



Ex2.)



Tips:

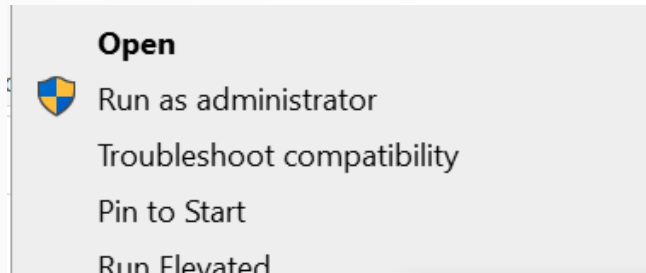
NVM Firmware version should be updated to **the latest version** by using a tool provided by PC vendors.

For example, drivers of HP EliteBook Series can be updated by [HP Support Assistant](#) on HP.com.

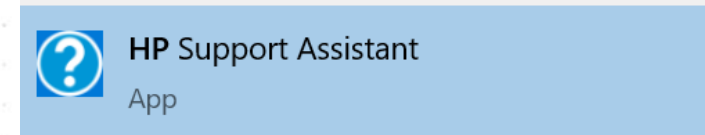
2. What is revision of Thunderbolt Control Center?

Ex.) HP Support Assistant for HP EliteBook

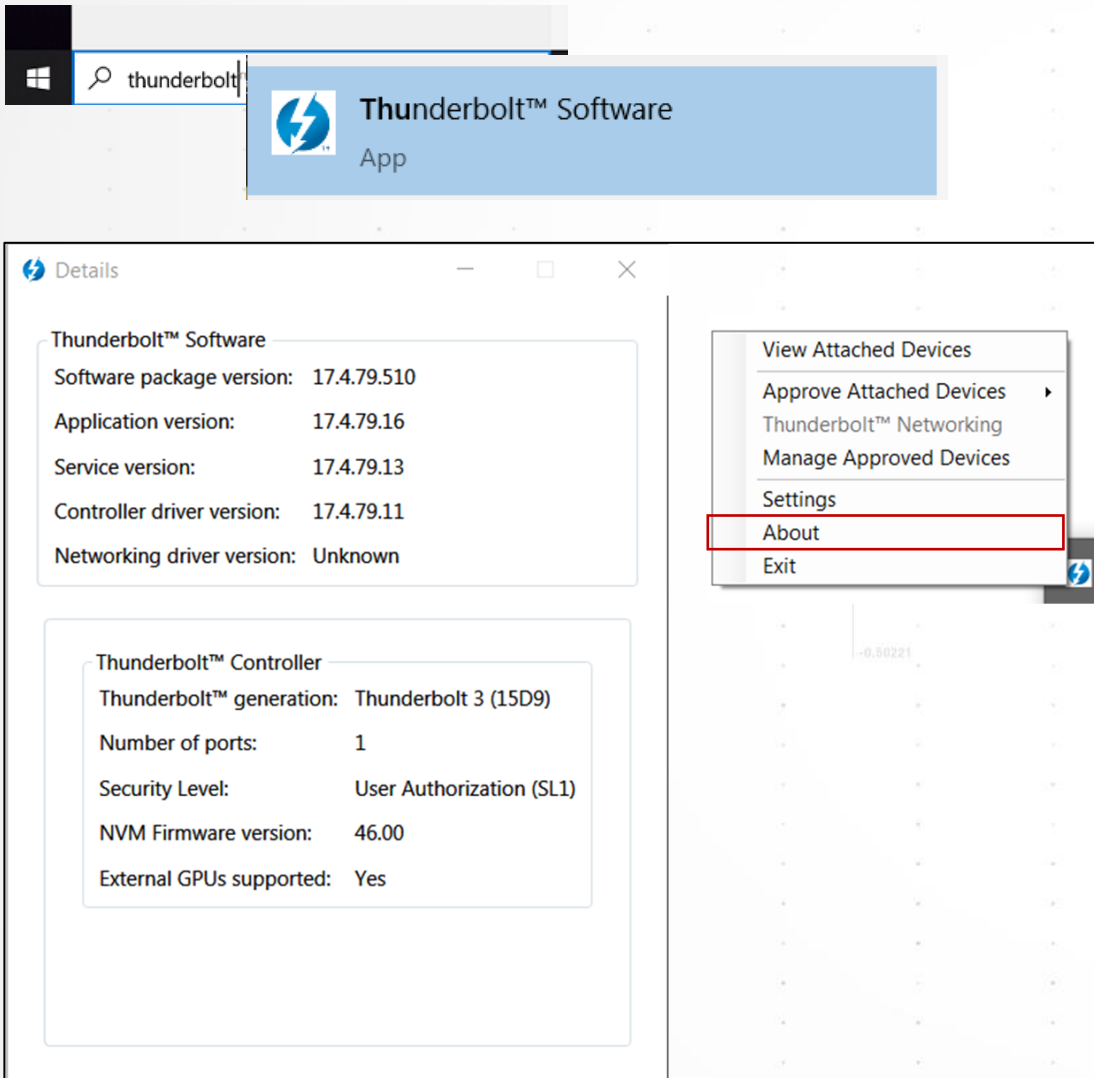
1. Go to HP site ([link](#)) to download “HP Support Assistant”
2. Right-click the saved *.exe file and select “Run as administrator”



3. Install HP Support Assistant with your host PC
4. Launch HP Support Assistant
5. Update Thunderbolt firmware, Thunderbolt driver, and BIOS of your PC to the latest version



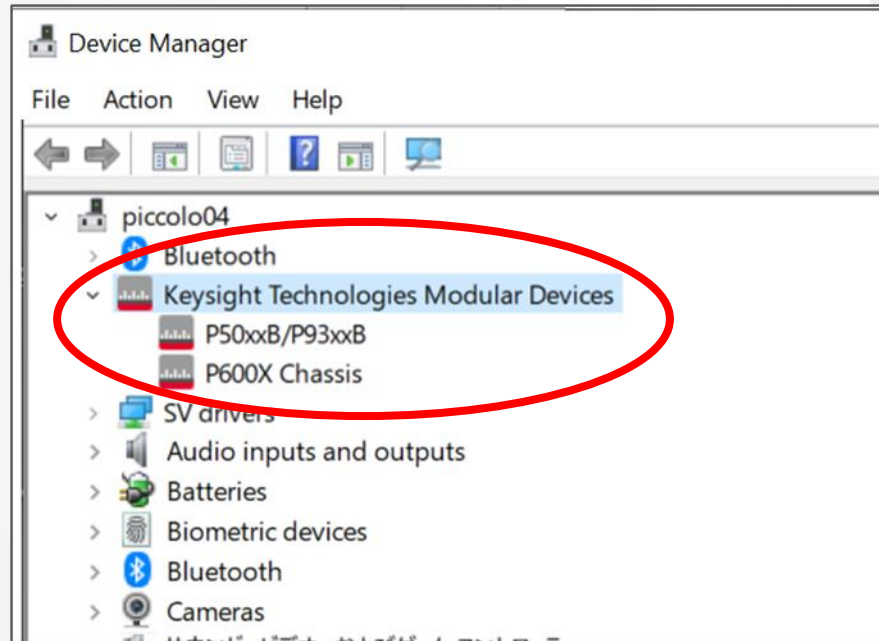
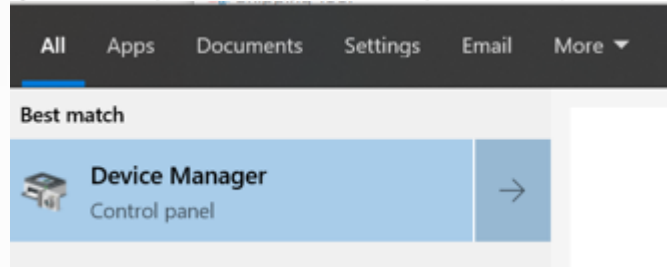
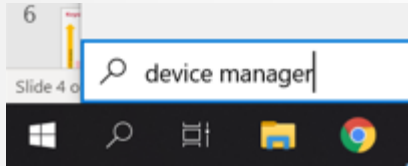
2. What is the revision of Thunderbolt Control Center?



Alternatively, for other PC with different software version,

- Launch Thunderbolt Software
- Right click on the system tray icon, click “About”
- Check Thunderbolt generation and NVM Firmware (Thunderbolt firmware) version shown in dialog.

3. Is your VNA identified with Device manager?

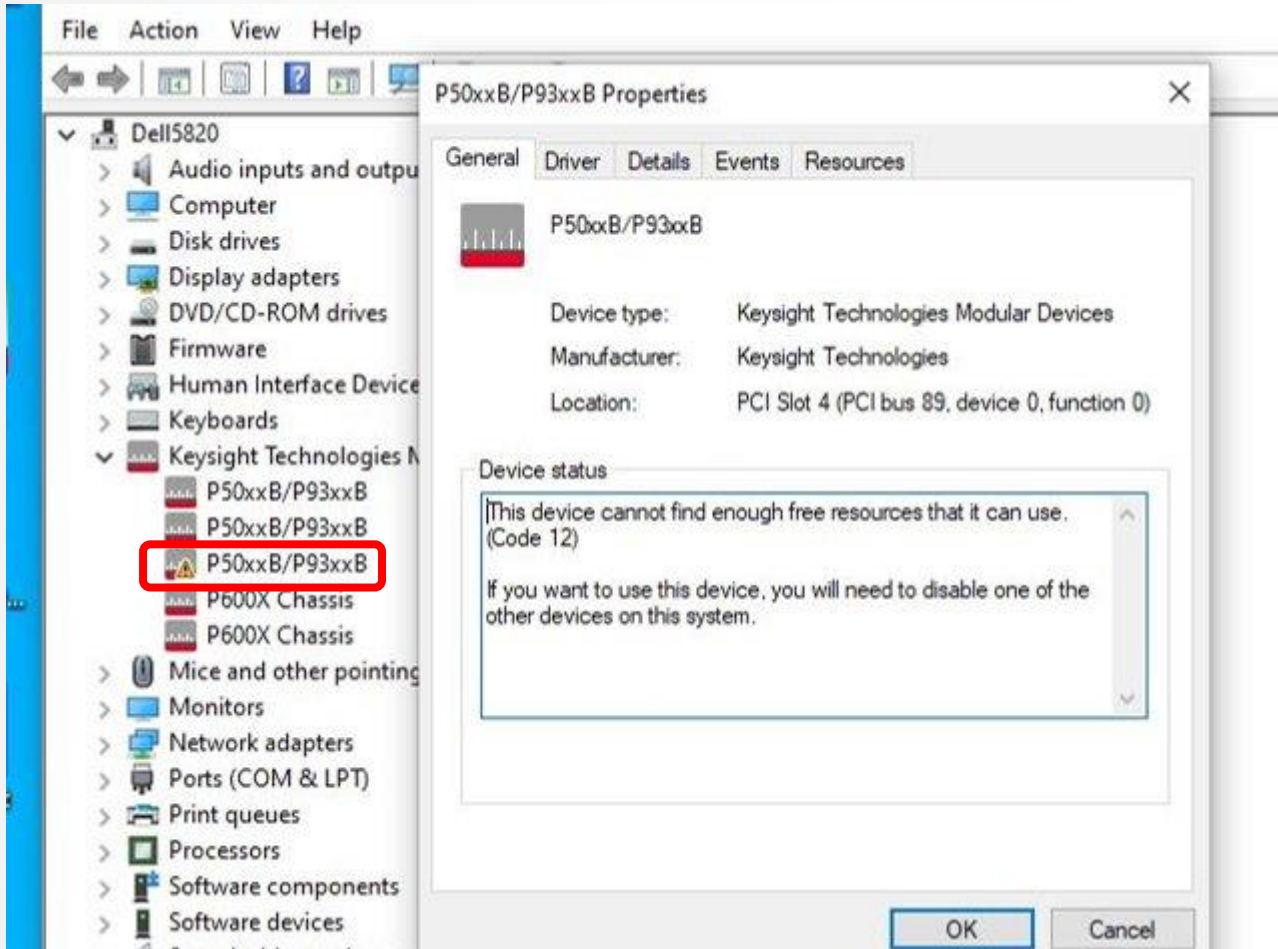


- Type in “device manager” in the Windows search bar to launch Device Manager
- Confirm “P50xxB/P937xB” or “P600X Chassis” are shown in Device Manager.

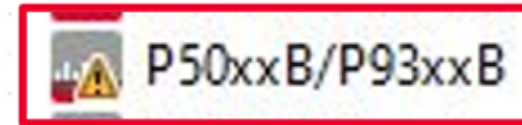
Tips:

If the model number of VNA (ex. P50xxB/P93xxB) and chassis (ex. P600xB) do not appear in Device Manager, BIOS, Thunderbolt firmware, or Thunderbolt driver with the host PC must be updated to the latest version.

3. Is your VNA identified with Device Manager?



- Check Properties of P50xxB/P93xxB if “!” icon below is shown on your P50xxB/P93xxB.



Tips:

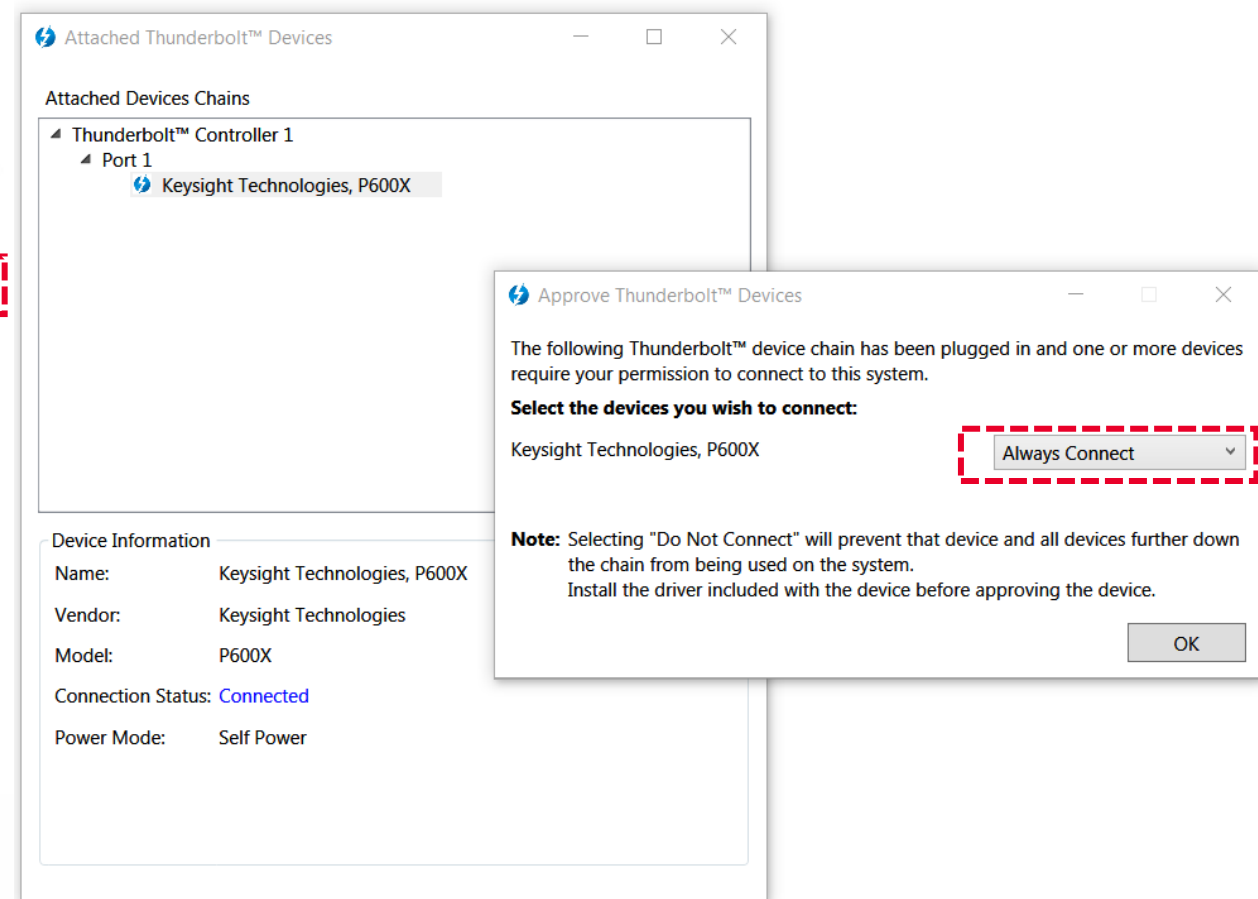
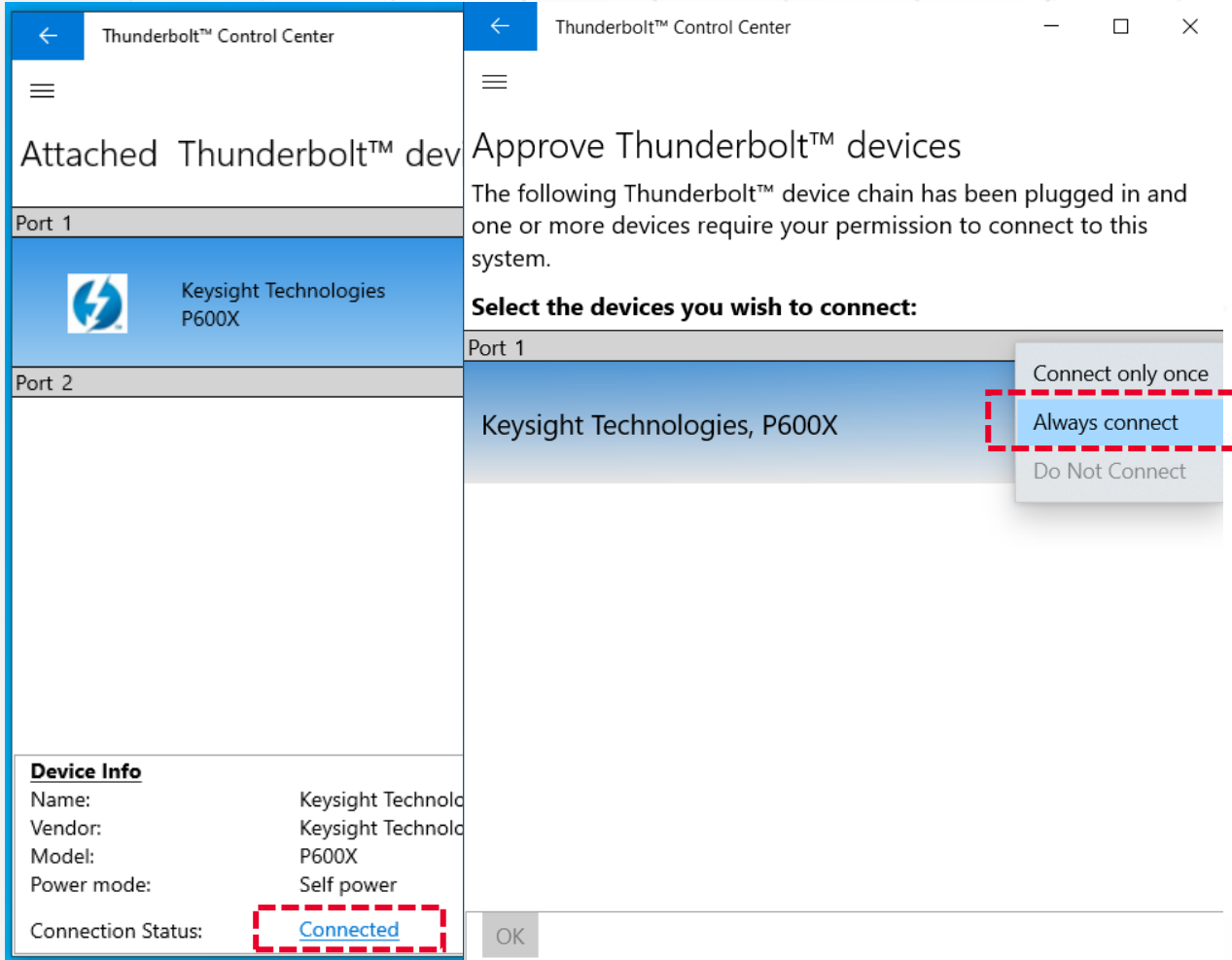
This icon appears when the host PC cannot allocate enough Kernel memory resources for PCIe communication within VNA. (VNA firmware cannot recognize the VNA).

To avoid the issue:

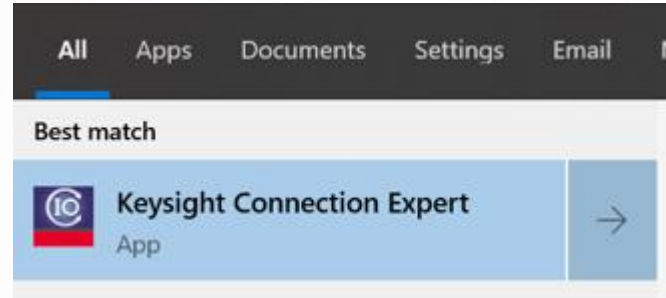
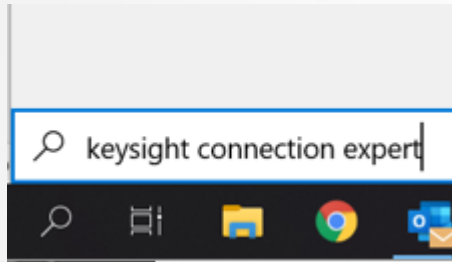
1. Disconnect the second VNA (for two-VNA operations) or
2. Use another PC in the support list

3. Is your VNA identified with Device Manager?

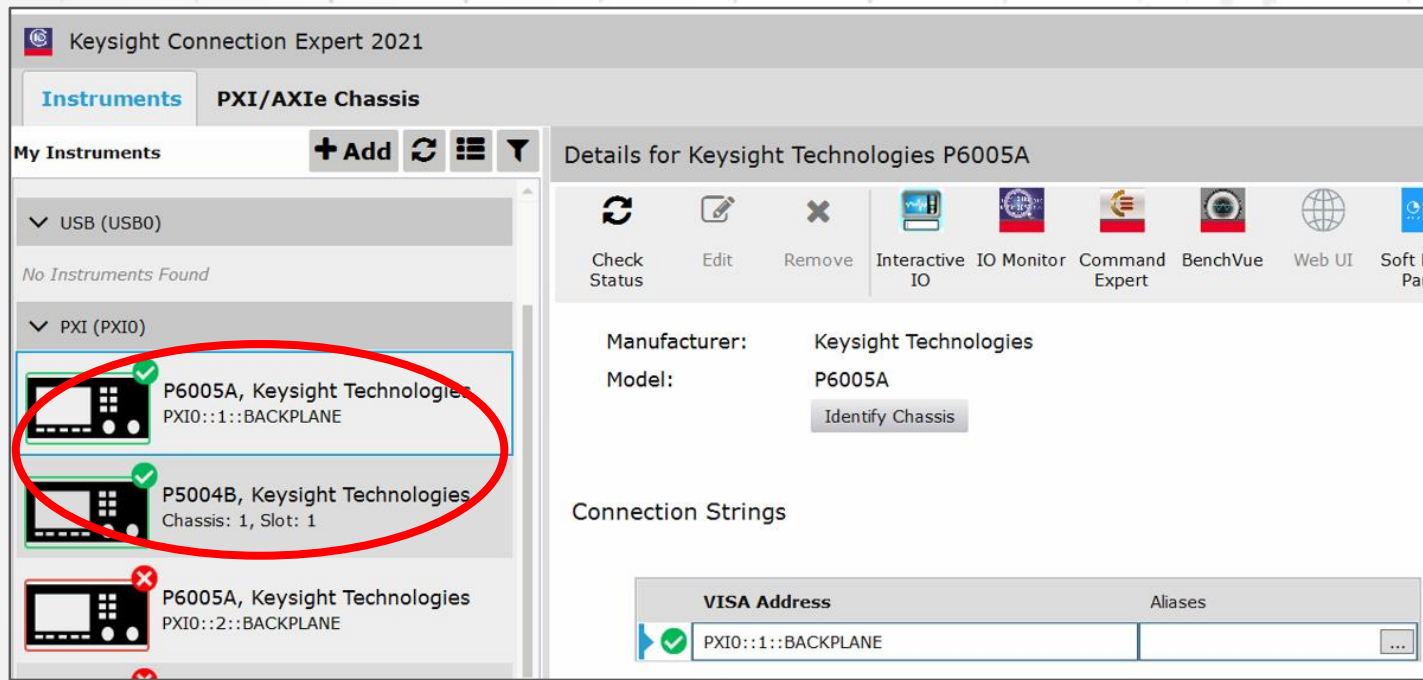
- In TBT Approved Thunderbolt Device list, select “Always Connect”.



4. Is your VNA identified with Keysight Connection Expert?

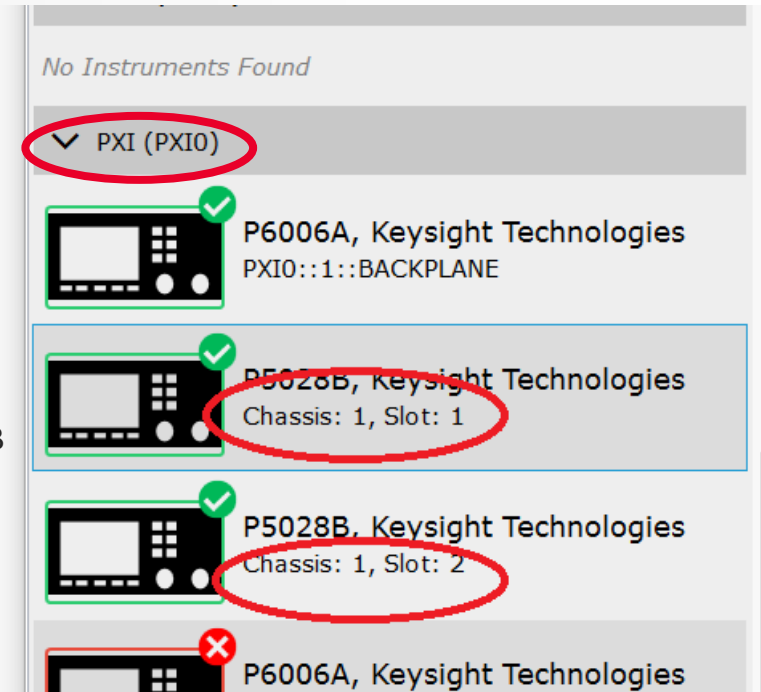


- Type in “Keysight connection expert” in the Windows search bar to launch Keysight Connection Expert.
- Confirm “P50xxB/P937xB” or “P600X Chassis” are shown in Device Manager.



4. Is your VNA identified with Keysight Connection Expert?

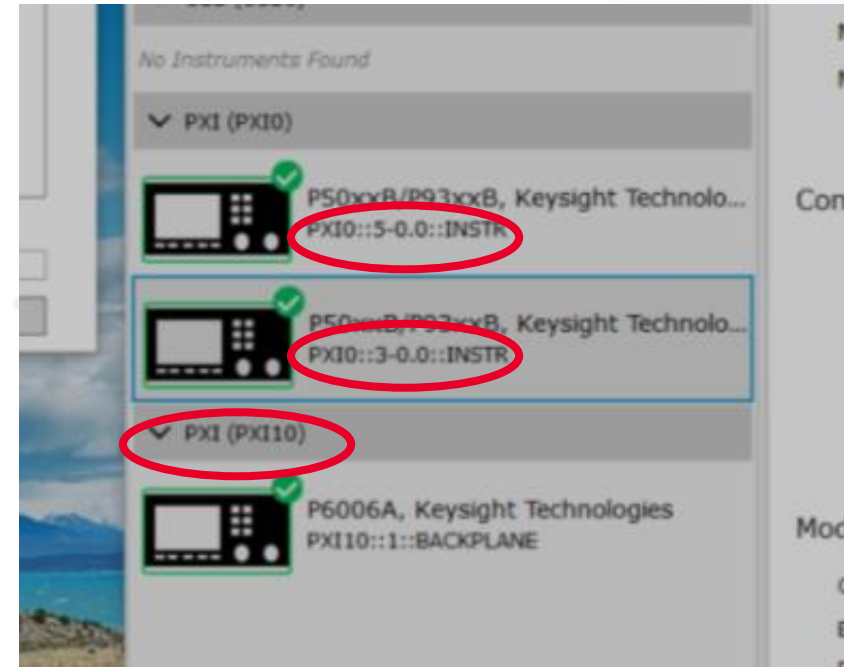
Successfully connected



Ex.) P5028B
Opt.402

- "P50xxB" (VNA model number) and "P6006A" (Chassis model number) should be displayed under "PXI (PXI0)".
- "P50xxB" should be displayed with "Chassis: 1, Slot x".

Connection failed

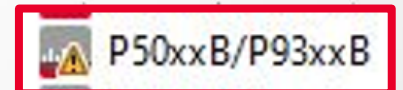


- "P50xxB/P93xxB" (VNA model number) is shown with "PXI0::x0.0::INSTR"
- "P6006A" (Chassis model number) is shown under "PXI (PXI10)".

Tips:

If displayed with Keysight Connection Expert:

1. Reboot host PC.
2. Check "!" mark is shown in Device Manager (See Tips in 3. Is your VNA identified with Device Manager?).



5. What is the model number of your host PC?

Check if your host PC is included in Thunderbolt x Host PC and VNA compatibility list.
If yes, try to use a PC in the compatibility list.

6. Do you use the latest version of VNA firmware and Keysight IO Libraries?

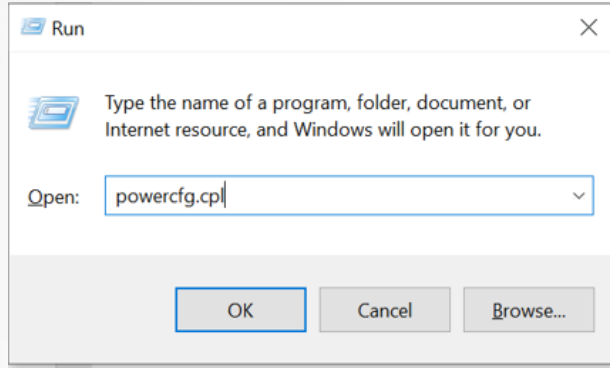
[PXIe/USB Vector Network Analyzer Firmware Update \(64 bit\)](#)

[IO Libraries Suite Downloads | Keysight](#)

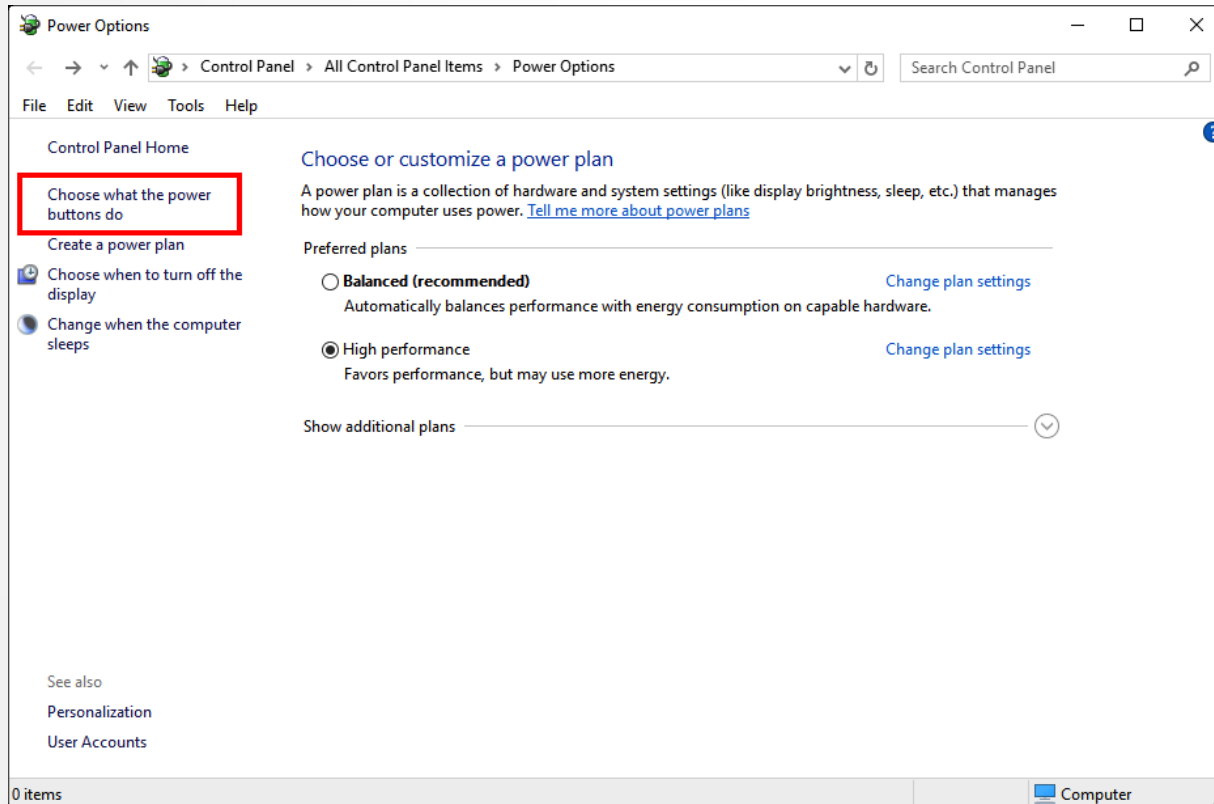
8. Is Kernel DMA Protection disabled?

- The Kernel DMA Protection feature of Windows 10 may cause errors in Device Manager for modules.
- For more information on how this works and how to prevent it, please refer to the following document from Microsoft and configure it appropriately <https://docs.microsoft.com/en-us/windows/security/information-protection/kernel-dma-protection-for-thunderbolt>

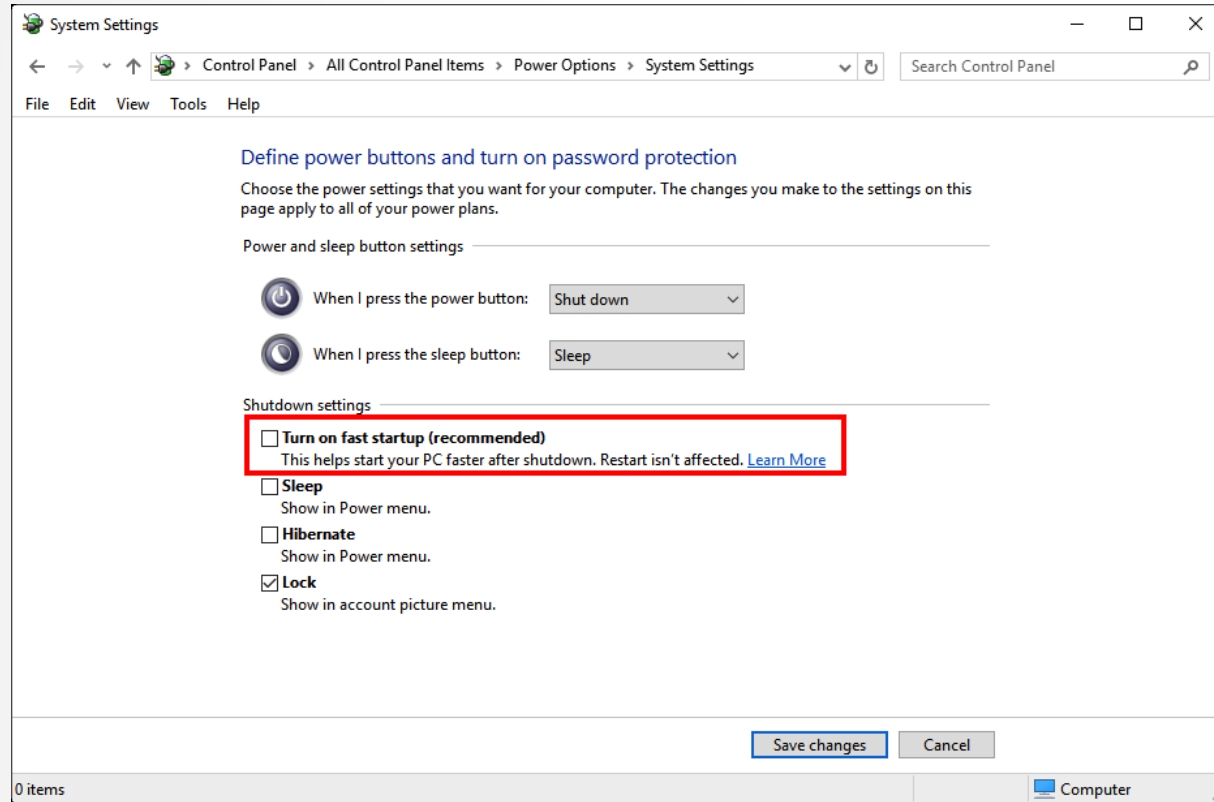
9. Is Windows 10 Fast Startup disabled?



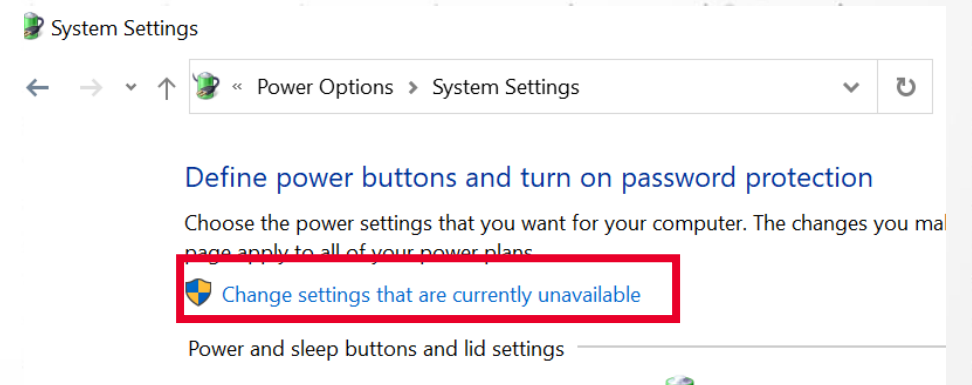
- Press Windows key + R to bring up the run dialog. Type in “powercfg.cpl” and click “OK” to launch “Power Options”
- Click “Choose what the power buttons do” from the menu on left.



9. Is Windows 10 Fast Startup disabled?

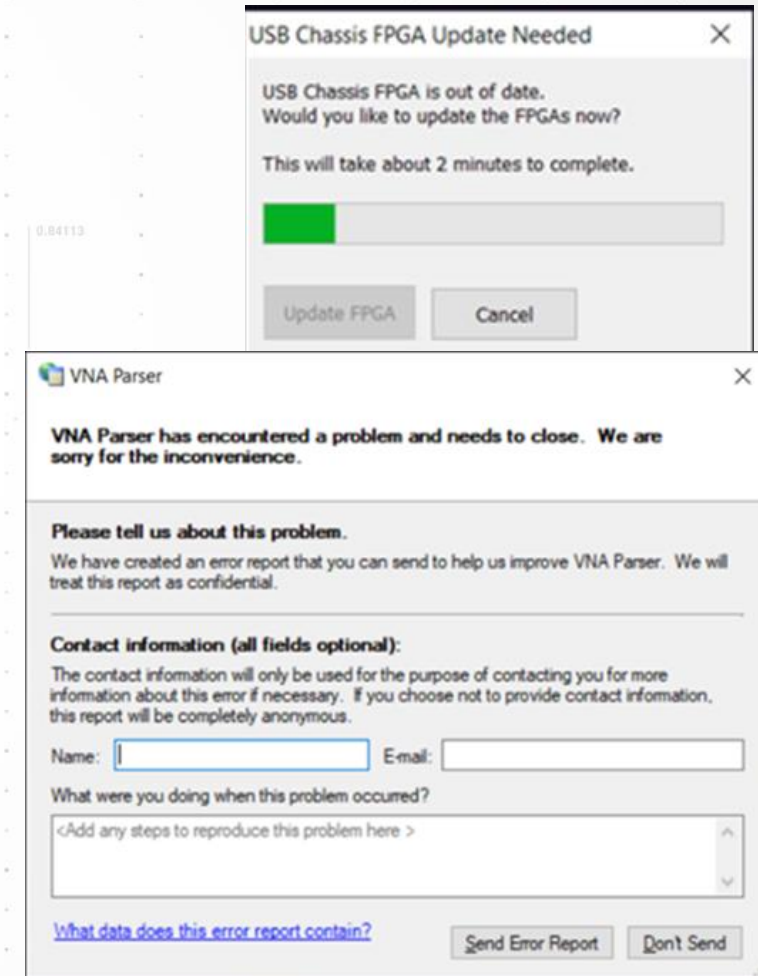
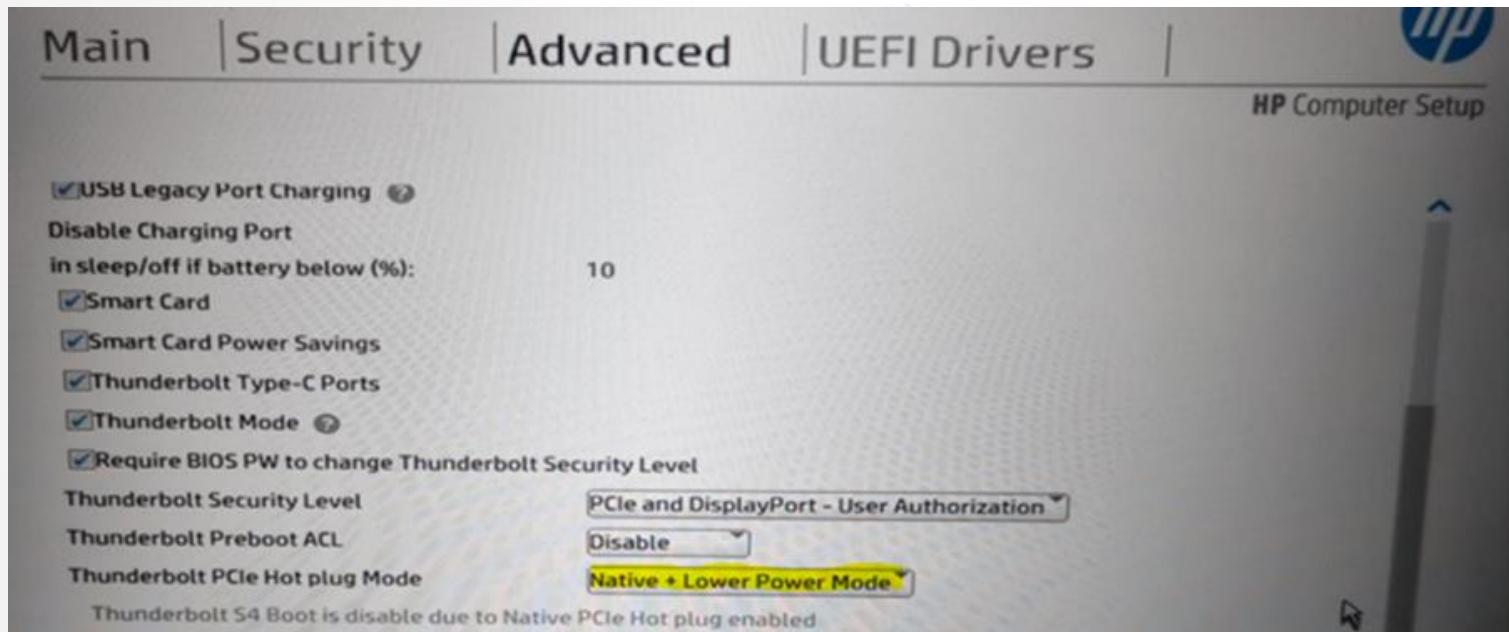


- Scroll down to show “Shutdown settings” and uncheck the box of “Turn on fast startup”.
- Note: if these option are greyed out then you may need to click “Change settings that are currently unavailable”.



10. Is Thunderbolt 3 PCIe Hot plug mode in BIOS (UEFI) correctly set?

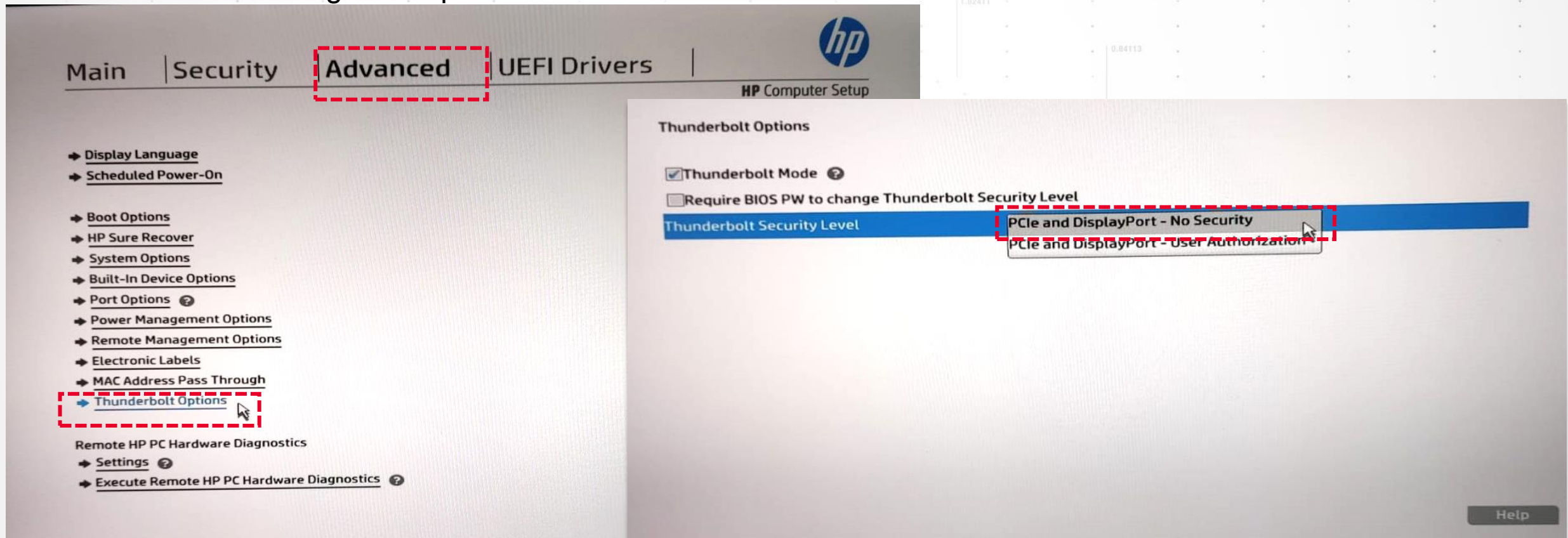
- Access to the BIOS (UEFI) settings page. In **Thunderbolt PCIe Hot plug mode**, select “Native + Low Power Mode”. Shown is the HP BIOS settings example.
- Note: if it is set to “Legacy Mode”, USB Chassis FPGA update will take a long time and fail to complete.



10. Is Thunderbolt 3 PCIe Hot plug mode in BIOS (UEFI) correctly set?

Additional information related to [Q3 Is your VNA identified with Device Manager?](#)

- To pre-approve Thunderbolt device connection for every device, access to BIOS (UEFI) settings. In **Thunderbolt Options**, select “PCIe and Display Port - No Security”. Save changes and restart. Shown is the HP BIOS settings example.



11. Is Interconnect cables for LO or control signals at VNA front panel properly?

- When “Self test failure: Sweep timeout” error message is shown in Host PC, check interconnect cables for LO or control signal properly.



2 VNA operation



1 VNA operation
of P5025B/26B/27B/28B or
of P5020B/P5021B/P5022B/P5023B/P5024B with Opt-402



FAQ

Q1: Do you know Host PC with Thunderbolt4 can communicate with P50xxB/P93xxB?

A1: Thunderbolt 4 is upward compatible with Thunderbolt 3.

It means without enhancing P50xxB/P93xxB firmware, Keysight expects PC with Thunderbolt 4 can communicate with P50xxB/P93xxB.

Remember that some of PCs with Thunderbolt 3 cannot communicate with P50xxB/P93xxB, due to PCIe resource conflict. This situation of Thunderbolt 3 remains in using PC with Thunderbolt 4.

Q2: Do I require Thunderbolt 4 cable to communicate with Host PC with Thunderbolt 4 communication port?

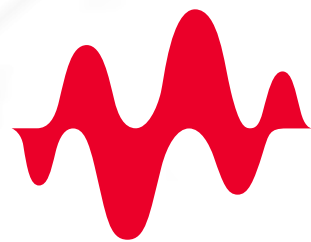
A2: No, you don't require Thunderbolt 4 cable. You can use Thunderbolt 3 cables which are recommended by Keysight.

You can use Thunderbolt 3 cables (ex. Y1701A-400 or 401) which are recommended by Keysight.

See [Streamline VNA series config guide](#) for more details.

Q3: Can I use a Thunderbolt to PCIe adapter on the PC for the operation with P50xxB/P93xxB?

A4: Yes, use a Thunderbolt to PCIe adapter which PC maker is recommended. See the compatibility list which have been evaluated.



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